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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/282,772	03/31/1999	SEIJI TANUMA	0941.63006	9077

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EXAMINER
QI, ZHI QIANG

ART UNIT	PAPER NUMBER
2871	

DATE MAILED: 05/21/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application N .	Applicant(s)	
	09/282,772	TANUMA ET AL.	
	Examin r	Art Unit	
	Mike Qi	2871	

-- The MAILING DATE of this c mmunication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *17 April 2003* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1 and 4-6* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1 and 4-6* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Claim Rejections - 35 U.S.C. § 103

1. The following is a quotation of 35 U.S.C. 103 (a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claim 1 is rejected under 35 U.S.C. 103 (a) as being unpatentable over Applicant admitted prior art (AAPA) in view of US 6,201,588 (Walton et al) and US 5,907,380 (Lien).

Claim 1, AAPA discloses (the "background of the invention" in the specification, especially col.2, line 19 - col.3, line 32 and Figs. 2A and 2B) that the conventional liquid crystal display device comprising:

- a first substrate (10);
- a second substrate (12),
- a liquid crystal layer (14) interposed between the first and second substrates (10 and 12);
- a group of electrodes such as a pair of electrodes (11a and 11b) disposed on the first substrate (10) (In-plane mode) so as to create an electric field in the liquid crystal layer general parallel to the first substrate in an activated state in which a drive voltage is applied to the pair of electrodes;

- when the drive voltage is not applied to the electrodes (11a and 11b) (in a non-active state), the liquid crystal molecules (16) are aligned generally perpendicular to the plane of the first substrate(10),
- when the drive voltage is applied to the electrodes (11a and 11b) (in a active state), the liquid crystal molecules are aligned generally parallel to the plane of the first substrate, i.e., aligned in the direction of the electric field inside the liquid crystal layer in the activated state (see the Fig. 2B for the symmetrical middle area).

AAPA does not expressly disclose that the liquid crystal molecules having a pre-tilt angle of less than 90°, and the opaque metal electrodes (first electrode, second electrode) being provided outside a display area, and a first projection provided on the first electrode and a second projection provided on the second electrode inducing pre-tilt angle.

However, Walton discloses (col.1, lines 19-21; col.7, lines 38-44) that it is very well known to provide a rubbed alignment layer to control the alignment and the pretilt angle of adjacent liquid crystal molecules in a liquid crystal layer, and it is preferable in the homeotropic liquid crystal cells that the pretilt angle of liquid crystal molecules be in the range from equal to or greater than 80° to less than 90°, so that to obtain a high display quality.

Lien discloses (col.5, lines 56-62; Figs.5 and 6) that the electrode wall (62) produce a lateral electric field that combines with the lateral electric field from the edges of the pixel electrode (26) defining the LC cell to cause the LC molecules to tilt in a desired direction when a

voltage is applied across the pixel, and the electrode wall (62) is formed on the first substrate (22) and is formed on the second substrate (24). Therefore, the principle of the electrode wall (62) is the same as the first projection is formed on the first electrode (e.g., pixel electrode) and the second projection is formed on the second electrode (e.g., common electrode), and the common electrode (second electrode) must be separated with the pixel electrode (first electrode) and the separation space is a part of the pixel, so as to control the LC molecules tilt angle in a desired direction. Lien also indicates (col.5, lines 59-62) that by providing such tilt control, conventional rubbing steps associated with alignment layers can be avoided.

Concerning the first and second electrode such as the pixel electrode and the common electrode being provided outside a display area in which transmission of an optical beam turned on and off, as the AAPA disclosed (Fig.2) that the pixel electrode (11a) and the common electrode (11b) (because the drive voltage is applied across the electrodes 11a and 11b) are provided outside display area in which transmission of an optical beam turned on and off, and the pixel area (display area) represented in Fig.2B is divided into a first region and a second region, so that the molecules (16) are tilt mutually opposite, such that the liquid crystal display device provides an excellent viewing angle characteristic.

Concerning the electrode is made of opaque metal that would have been at least obvious as the electrodes must be made of conductive material and the opaque metal such as Aluminum having higher reflectivty and would increase the display brightness.

Therefore, it would have been obvious to those skilled in the art at the time the invention was made to have a pre-tilt angle of less than 90° and a first projection provided on the first electrode and second projection provided on the second electrode, and the electrodes (pixel electrode and common electrode) made of opaque metal provided outside a display area as claimed in claim 1 for achieving a high display quality and improving the response speed.

5. Claim 4 is rejected under 35 U.S.C. 103 (a) as being unpatentable over Applicant admitted prior art (AAPA) in view of US 6,180,026 (Rieger et al).

Claim 4, AAPA discloses (the "background of the invention" in the specification, especially col.2, line 19 - col.3, line 32 and Figs. 2A and 2B) that the conventional liquid crystal display device comprising:

- a first substrate (10);
- a second substrate (12),
- a liquid crystal layer (14) interposed between the first and second substrates (10 and 12);
- a group of electrodes such as a pair of electrodes (11a and 11b) disposed on the first substrate (10) (In-plane mode) so as to create an electric field in the liquid crystal layer general parallel to the first substrate in an activated state in which a drive voltage is applied to the pair of electrodes;
- when the drive voltage is not applied to the electrodes (11a and 11b) (in a non-active state), the liquid crystal molecules (16) are aligned generally perpendicular to the plane of the first substrate(10),

- when the drive voltage is applied to the electrodes (11a and 11b) (in a active state), the liquid crystal molecules are aligned generally parallel to the plane of the first substrate, i.e., aligned in the direction of the electric field inside the liquid crystal layer in the activated state (see the Fig. 2B for the symmetrical middle area).

AAPA does not expressly disclose that the liquid crystal layer having a birefringence larger than about 0.1 but smaller than about 0.25.

However, Rieger discloses (col.3, line 27 - col.4, line 29) that a nematic liquid crystal mixture having a birefringence Δn of at least 0.12, and these mixture allow short switching times at reasonable threshold voltages, and the birefringence Δn of the nematic liquid crystal mixture is 0.12 to 0.20, preferred 0.13 to 0.18 (within the range 0.10-0.25), and as Rieger indicated (col.4, lines 23-24) that such mixtures shows a reduced viscosity and allow short switching times so as to reduce the switching time.

Therefore, it would have been obvious to those skilled in the art at the time the invention was made to use the liquid crystal layer having a birefringence is 0.10 to .025 as claimed in claim 4 for achieving a short switching times so as to increase the response speed.

6. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over AAPA and Rieger as applied to claim 4 above, and further in view of US 5,374,374 (Weber et al).

Claim 5, Weber discloses (col.12, lines 45-51) that a liquid crystal mixtures contain tolan compounds, so as to allow using smaller layer thickness and giving significantly shorter response times.

Therefore, it would have been obvious to those skilled in the art at the time the invention was made to use a liquid crystal layer contain a tolan-family component as claimed in claim 5 for achieving a shorter response times so as to increase the response speed.

7. Claim 6 is rejected under 35 U.S.C. 103 (a) as being unpatentable over AAPA in view of US 6,201,588 (Walton et al), US 5,907,380 (Lien) and Yoshida et al "Inclined Homeotropic Alignment by Irradiation of Unpolarized UV Light" *jpn. J.Appl. Phys.*, Vol.36 (1997), pp.428-431.

Claim 6, all the limitations are disclosed from the AAPA as the explanation above. AAPA also discloses (col.3, lines 10-13) that a molecular alignment film provided on the surface of the substrate (10) to cover the electrodes (11a and 11b).

Concerning the liquid crystal molecules having a pre-tilt angle of less than 90°, and a first region in the molecular alignment film in correspondence to the first electrode and a second region in the molecular alignment film in correspondence to the second electrode formed by ultraviolet irradiation inducing pre-tilt angle, that is the same as the first projection and the second projection in the claim 1, and that at least would have been an obvious variation as the explanation of Walton and Lien above, except the regions inducing the pre-tilt angle are formed by ultraviolet irradiation.

However, Yoshida discloses (abstract) that rubbing the surface of the polyimide film (alignment film) presents the problems of contamination and static electricity (that could damage the switching elements under the alignment film), so that using UV alignment technology without rubbing the surface.

Therefore, it would have been obvious to those skilled in the art at the time the invention was made to employ ultraviolet irradiation to form the first region on the first electrode and second region on the second electrode inducing the pre-tilt angle as claimed in claim 6 for preventing the contamination and the static electricity.

Response to Arguments

8. Applicant's arguments filed on Dec.18, 2001 have been fully considered but they are not persuasive.

Applicant's **only** arguments are as follows:

1) The references do discloses that the first and second electrodes are of an opaque metal provided outside a display area.

2) The references do not discloses two different projections are formed on two different respective electrodes.

3) The reference Rieger teaches away from the claim 4.

Examiner's responses to Applicant's **only** arguments are as follows:

1) The reference Lien discloses (col.5, lines 56-62; Figs.5 and 6) that the electrode wall (62) produce a lateral electric field that combines with the lateral electric field from the edges of the pixel electrode (26) defining the LC cell to cause the LC molecules to tilt in a desired direction when a voltage is applied across the pixel, and the electrode wall (62) is formed on the first substrate (22) and is formed on the second substrate (24). Therefore, the principle of the electrode wall (62) is the same as the first projection is formed on the first electrode (e.g., pixel electrode) and the second projection is formed on the second electrode (e.g., common electrode), and the common electrode (second electrode) must be separated with the pixel electrode (first electrode) and the separation space is a part of the pixel, so as to control the LC molecules tilt angle in a desired direction.

Concerning the first and second electrode such as the pixel electrode and the common electrode being provided outside a display area in which transmission of an optical beam turned on and off, as the AAPA disclosed (Fig.2) that the pixel electrode (11a) and the common electrode (11b) (because the drive voltage is applied across the electrodes 11a and 11b) are provided outside display area in which transmission of an optical beam turned on and off, and the pixel area (display area) represented in Fig.2B is divided into a first region and a second region, so that the molecules (16) are tilt mutually opposite, such that the liquid crystal display device provides an excellent viewing angle characteristic.

Concerning the electrode is made of opaque metal that would have been at least obvious as the electrodes must be made of conductive material and the opaque metal such as Aluminum having higher reflectivty and would increase the display brightness.

2) In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., two different projections are formed on two different respective electrodes.) are not recited in the rejected claim(s) (the claims 1 and 6 describe the electrodes, i.e., pixel electrode and common electrode made of opaque metal). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

3) The reference Rieger discloses (col.3, line 27 - col.4, line 29) that a nematic liquid crystal mixture having a birefringence Δn of at least 0.12, and these mixture allow short switching times at reasonable threshold voltages, and the birefringence Δn of the nematic liquid crystal mixture is 0.12 to 0.20, preferred 0.13 to 0.18 (within the range 0.10-0.25), and as Rieger indicated (col.4, lines 23-24) that such mixtures shows a reduced viscosity and allow short switching times so as to reduce the switching time.

Conclusion

9. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mike I whose telephone number is (703)308-6213 .

Mike I
May 5, 2003.

T. Chowdhury
Primary Examiner